

Importance of ringing and tag reading in the Caribbean Flamingo (*Phoenicopterus ruber*) and the formation of ring reading groups

Xiomara Gálvez-Aguilera*, José Morales Leal, Frank Espinosa, Van Slobbe, Juan Carlos Ordoñez, Rodrigo Migoya-Von Bertrab, Alexander Dzib.

This informative article constitutes a summary that is part of chapter IV of the book on the Caribbean flamingo (*Phoenicopterus ruber*) in the editing process. (Galvez et., al. Unpublished)

Due to the place, they occupy in the food chain and the water conservation conditions they need to reproduce and feed, flamingos, like the rest of the predominant waterfowl in wetlands, are sensitive to any ecological change (Denis et al., 2006). They can carry out large transboundary, latitudinal, altitudinal, and local displacements, according to weather conditions and resource availability. In the Yucatan peninsula, they make movements with a seasonal temporality, longitudinally along the coast depending on water changes, which affects their diet associated with extreme salinities (Arengo F. et al., 1999, 2000). At present, the distribution patterns of the species in Yucatan are more complex, directly linked to the sudden and frequent variations that may occur during the increasingly less marked climatic seasons, which affect individuals of different age groups differently. (Galvez et al., 2014, 2016 and Plascencia-Vázquez et al. 2017)

The Caribbean flamingo - also known as the American flamingo - can be found on all the coasts of the Caribbean islands, and some continental countries such as Mexico, Venezuela, and Colombia, being able to observe flocks feeding from Florida (USA) to all the Caribbean islands, even groups being reported in Honduras (Anuar Romero 2022) and northern Brazil (Bernardon B. 2014). There are four species of flamingos registered for Brazil: *Phoenicopterus ruber* (American Flamingo), have a reproductive colony on the coasts of the state from Amapá (Sick 1997) in (Bernardon B. 2014). Paulo Rodrigo Silvestro recorded groups of up to 80 individuals in 2013 in Amapá Cabo Orange National Park, com. Pers, to the GCFC).

These flocks identify and provide a special attraction for the whole region, becoming in many of these countries, an economic item for tourism - Paradoxically, the species depends on the few reproductive sites that currently exist (Galvez X. 2011, 2014b, 2016)-. Dangerously, this species shows a false abundance due to its colorfulness, size, gregarious habits, and nomadic character (Migoya R and Galvez 2011, Galvez X., 2015). Today the breeding sites of the Bahamas, Venezuela, Mexico, Cuba, and Bonaire are the most important because of the number of specimens they contribute. In Ecuador, a genetically isolated population breeds in the Galapagos Islands (Soler et al, 2022). In the last ten years, other small colonies have been appearing and even returning to previously used sites. New sites have been confirmed in Cuba, Venezuela, and Yucatan (an additional colony to the one in Ria Lagartos since 2011 is established annually in El Palmar); in 2022 the main colony was established in San Crisanto. Is this a good or bad sign? Because of the breadth and importance of the subject, this aspect is discussed at length, as it is part of a chapter in the book in progress, THE Caribbean flamingo, which will be available soon.

Its transboundary dispersion has scientific support that proves its presence in the United States, the Cayman Islands, Cuba, and probably in other countries with not yet proven inference, such as the Bahamas, Haiti, and the Dominican Republic (Galvez X, et al., 2016), (through the recapture of visible code rings placed by Niños y Crías A.C. in Yucatan) and (with radio-transmitters, placed by FPYE Fundación, in 2017, of which two arrived in Cuba). The process of verification by reading rings is less expensive and more durable in several years than radio instrumentation, but it implies a longer response time, which can only be shortened by increasing the number of readers and systematizing the search and reading action in all possible countries, both in the Continental and the Insular Caribbean.

Why is Cuba a priority for this band reader project of the Caribbean Flamingo Conservation Group?

These birds are distributed (widely) and can be easily observed in shallow waters in almost all coastal ecosystems of the Cuban archipelago, although the highest concentrations of flocks are observed on the southern coast of Granma province;

in the Jardines de la Reina archipelago; in the Sabana Camagüey archipelago; in Tunas de Zaza (south of Sancti Spiritus); in the Guanaroca lagoon (Cienfuegos) and in Ciénaga de Zapata (Morales Leal, 1996). Specimens banded in Yucatan have been reported, in addition, in the Cayería Sur de Pinar del Río, La Coloma, Cayo las Picúas in the center of the country and Cayería Jardines de la Reina in the last decade (Gálvez et al. 2017). More than 162 feeding areas are recognized in Cuba (Morales Leal, 2011, speaker at the XVIII regional meeting Society for the Conservation and Study of Caribbean Birds (SCSCB) in Freeport, Bahamas).

According to the results of flamingo censuses conducted at least every five years, (between 1989 and 2010) it is evident that the population increased from 124 000 to 181 000 individuals in 20 years, (José Morales et al., 2010, 2013), (presentations available on the blog www.caribbeanflamingo.org. Comparing the nesting censuses conducted by Dr. José Morales Leal, in the nesting areas in the early 2000s and those recorded a decade later, he found that between 2010 and 2012, two additional nesting colonies, in Caibarién and Cayo Las Brujas, had disappeared due to disturbances associated with the construction process of the causeway to Cayo Santamaría, and the construction of an airport in Cayo Las Brujas. However, the number of nests had increased at the mouth of the Máximo River, from 43 650 in 2002 to 60 500 in 2011, which suggests that many breeders moved on this occasion, within the country to the three fundamental breeding sites, which were at the time, the mouth of the Máximo River, Delta del Cauto, where it nests in numbers exceeding 20-30 thousand nests each year, (D. Denis et al. 2005) and in Cayo Picúas, where 3 580 individuals were recorded nesting in 1991 and by 1996 there were 17 800 (Berovides and Castillo Pers. Comm. 2016).

The Máximo River delta was home to the largest colony in the Caribbean in the 1990s, and according to annual nest monitoring from 1984 to 2012, the average number of nests maintained a steady increase until 2003-2005, when channelization along the river and the strong and prolonged dry season, led to the salinization of a large area of the delta, decreasing the availability of habitat for resident waterfowl, the stay of migratory species and the reproduction of the flamingo, to this was added the authorization of non-commercial fishing that brought associated disturbances in the nesting area (Jose

Morales, Lodi Vázquez and Ariam Jiménez 2010). By 2012 nests had declined to 32,000 mounds (Morales et al., 2013, at the GCFC meeting). Since 2013 flamingos abandoned what was considered for many years, the largest breeding site in the Caribbean (Gálvez X. and D. Denis, 2017). Although between February and June there are still some flocks hanging around in the Rio Máximo area, the reality is that since 2014 they have not built nests (Ruiz R. Maylén et al., 2020).

In Colonia De Cayo Las Picúas, climate change is also affecting the flamingos, the sea level has been rising, the flamingos have been moving to the interior marshes every year since 1998, later it was detected that they had moved to Punta Arena Key, a more intricate site surrounded by small mangrove cays, and where monitoring was maintained from 2000 to 2013. Today the sea level exceeds the height of the nests, drastically modifying the conditions of the site. On the other hand, the Majá river, main source of fresh water for the colony in Las Picúas, has visibly decreased its flow since 2005 and presents organic contamination and large flocks of flamingos are seen traveling to the Alacranes dam, more than 30Km away) for fresh water, a long and full of obstacles journey, for the chicks (Berovides et al. 2016 pers. comm.) data presented at conference XXI of SCSCB in Cuba, by Gálvez et al, (2017).

About the largest colony remaining at present, located in the Delta of Rio Cauto, we have no technical data from recent monitoring, but in the study, we did of review a photographic location of banded birds, in - American Flamingo, version 1.0. (J. del Hoyo et., al. 2020) - we found photos with flocks formed by numerous chicks, (in the localities of Crucero Granma, Baitiquirí, Rio Guantánamo, Playa Santa Lucía, among others) which indicates that the reproduction is maintained in the delta of the Rio Cauto.

Why do we consider that the situation in Cuba can be assumed as a red alert for the flamingo in the region?

Rio Maximo in Cuba, Inagua in the Bahamas, Los Olivitos in Venezuela, and Ria Lagartos in Yucatan, (Mexico) because of the space available to them with adequate substrate, isolation conditions that provide them with protection, high salinity that provides them with available food and proximity to sites with availability of fresh water to carry their chicks -once they lose the gland that allows them to process salt-, They are fundamentally responsible for the abundance of flamingos that we observe today in all other countries, from Florida to the north of Brazil, in addition to the contribution of the Bonaire colony that has been growing for the last 20 years.

Currently, several flamingo breeding sites are recognized within the Cuban territory, such as the colony recently detected in Cayo Lucas, north of Sancti Spiritus (Ruiz et al., 2014) and another one in the Nuevitas cay, (Ruiz R. Maylén et. al., 2020),

and although this is not bad news, in our opinion these findings are not due to population growth, but to the possible rearrangement of a small part of the breeders the Río Máximo, due to the loss of colony, which reached 50,000 pairs in 2010 (Morales et al., 2010).

There is a possibility that a large part of the breeders that left Río Máximo may have left the country to join larger breeding sites due to the conditions explained above, which offer them greater guarantees, such as Los Olivitos in Venezuela where continuous reproduction has been reported for several years (Espinoza, F. & Perozo, H. 2008) until to the present, or have gone to Inagua in the Bahamas, since out of 27 metal bands in dead flamingos, collected in Cuba, 22 came from the Bahamas Islands, - banded between 1964 and 1976 -, and 5 came from Yucatan, out of 100 banded in the nineties, (Blanco et al., 2001)

Morales Leal, 2013 at the GCFC meeting, confirms this, with his observations, stating that on the occasions when Bahamian flamingos had not nested, the Rio Maximo site was overflowing. As less probable, but not impossible, some could have been incorporated to Ria Lagartos in Mexico, - In this case we consider it so, as unlikely, due to the fact that, to date, no rings have been read from those placed in Cuba or Inagua, not even between 2010- 2015 where the field effort was increased when systematic reading groups were established along the Yucatan coast and the reading figures amounted to 8 652 reports (1845 belonging to different individuals). (Gálvez et al, 2014b). However, it should be noted, that the proportion of flamingos banded in these countries, is low compared to the size of their colony and that may be a reason for the non-observation.

In the rest of the countries there also exist or have existed additional colonies to the fundamental one, which constitutes alternative nesting sites, sometimes as test or learning sites for many immature and young breeders (observations confirmed by banding in alternative colonies in Yucatan, such as Punta Manolo, Celestun and Charca Salinera) that can build nests, and even achieve a low to moderate breeding success but serve as a relief even for years when the number of breeders that are incorporated is high (by Galvez. X. Unpublished). These small colonies, although they are still important, and in some cases can even be considered precursors of a new settlement for the larger colony, can hardly produce sufficient of individuals numbers to replace, at least in the short or medium term, the loss of a source colony such as for example, Río Máximo.

In 2007, the first meeting of experts from several countries working with the Caribbean Flamingo was held and in 2013, it was repeated, reaffirming the structure of the GCFC with one or two representatives per country, creating the statutes, working committees, and approved by the ten countries present, the five fundamental lines of research to homogenize research on the species under standardized protocols, so that the results would be comparable in terms of proposing conservation actions. The lines approved for research until 2025 were: Monitoring studies and habitat use under a single methodology; Reproductive studies, ethology, spatial design, reproductive success, and association with anthropic and climatic factors; Sampling for population and mitochondrial genetics; Population dynamics and survival studies (flock structure, distribution); Use of remote sensing and habitat changes over time -predictive models-.

Several studies within these approved lines have been published, while others are in progress. Some that specifically focus on the comparison of the climatic ecological niche of the Caribbean Flamingo (*Phoenicopterus ruber*) between insular and continental populations, such as "Influence of climatic variables and disturbances in the reproductive parameters of *Phoenicopterus ruber* in the Yucatan Peninsula, by E Salazar et al., (2020)", also available in the Blog. One of the most important considerations found was that disturbance constituted the main factor that affected the reproductive parameters of the species in Yucatan. The predictive: "How much will climate change affect the breeding area of the Caribbean flamingo (*Phoenicopterus ruber*) in Mexico and Cuba by 2070?", makes a statistical evaluation of the variations predicted by two climate models for 2050 and 2070, in the areas of greatest probability of presence of flamingo breeding colonies for Mexico and Cuba, the probability of presence of breeding colonies was modeled from 40 points of presence, 10 bioclimatic variables, topography and vegetation formation. The modeling was carried out 50 times using the maximum entropy algorithm (MaxEnt) by Alejandro Rodríguez-Ochoa and D. Denis (in process of publication). The preliminary results of the study "Climatic Ecological Niche Comparison Between Continental and Island Populations of Caribbean Flamingo", associated the influence of climatic variables in the populations of Flamingos of Cuba and Mexico, -using the database of banded birds-,

were presented by its author, Gisel Morejón Martínez, Career of the University of Havana, under the tutorship (Dr. Dennis Denis and Dr. Xiomara Gálvez) receiving the "Florentino García Special Prize" of the Cuban Society

RING	YEAR OF OBSERVATION	BORN AND RINGED	AGE AT RECAPTURE (years)	REPRODUCTION SITE
DFVS	2007	2000	7	Río Máximo, Camagüey
HZTV	2009	2003	6	Río Máximo, Camagüey
FZDF	2010	1999	11	Río Máximo, Camagüey
HBZB	2010	2004	6	Río Máximo, Camagüey
DFHC	2011	2000	11	Río Máximo, Camagüey
HCBH	2014	2004	10	Cayo Las Picúas, Villa Clara

of Zoology. However, it is far from enough to propose regional management actions such as those needed.

The contribution of the work that Mexico has been doing, through CONANP with its allies, first Niños y Crías A.C. from 1999 to 2014 and then the Fundación Pedro Y Elena Hernández A.C. from 2015 - 2020, with the annual ringing of chicks, is very valuable precisely because it is the marked individuals that can give us comparable information about the local problems that are occurring in the areas of use of the flamingo and be able to take effective measures to conserve their presence in each country. Thanks to Mexico's efforts, there is a wealth of scientific information on this species that can help us understand many processes of the ecology and behavioral patterns of flamingos. It is necessary to continue promoting and collaborating so that other countries join in this effort to study and preserve healthy populations of this species, which is of great interest to all.

In Cuba, the process of reading rings in individuals marked in Yucatan goes back several years, with an important number of specimens recovered. Although the banding of chicks systematized consecutively in the Yucatan colony began in 1999, the first band reported in Cuba was of an adult (DFVS) with 7 years of having been banded in Yucatan and observed incubating in Rio Maximo, Camagüey in 2012. Five individual's bands have been detected and reported in that colony, by José Morales (Fig. 1) and a banded specimen, was observed in the colony of Cayo Picúas, in Villa Clara (Fig.2) (Table 1). At the third important site, located at the mouth of the Cauto River, in Granma province, no attempt has ever been made to read it due to the characteristics of this marsh, which make reading difficult, but we do not rule out the possibility that there may also be banded reproducers, using it as a site of breeding.



Fig. 1. DFHC in 2000 nacido en Yucatán en el año 2000 fotografiado anidando en Río Máximo, Camagüey, Cuba, 2011



Fig. 2. nacido en 2004 y fotografiado en 2014, anidando en Cayo Las Picúas, Villa Clara, Cuba

Table No1. Flamingos born in Yucatan incubating in two breeding sites on the Island of Cuba

Until 2012, only the breeding sites of the species in the country were monitored regularly, and therefore only in these places, the breeders banded in Yucatan were detected. We could ask ourselves, did these birds arrive as young birds, were they adult breeders that went to nest in other colonies, are the flocks that leave Yucatan made up of individuals of different age categories, how often do some of the individuals that leave return to

Yucatan or not, we cannot know this with certainty until follow-up studies are carried out over the years on the same marked individual. After signing an agreement with the University of Havana and requesting support from the Ciénaga de Zapata staff in (2012) to conduct tours with a certain frequency (mainly from September to February), The field effort to search for marked individuals was expanded. and the question of whether only adults banded in Yucatan were arriving in Cuba was answered by also monitoring feeding habitats, in addition to the breeding sites. It quickly corroborates something that had already been considered for other species and had been mentioned "it is mostly the young specimens that leave in search of new territories". (Gálvez X. et al., 2016). **Table No. 2** shows the banded specimens that could be photographed in sites in southern Cuba, where optical equipment was available (we know since 2001, from the work of Pedro Blanco, that they frequently arrive south of Santi Spiritus, only that there is no band reading at this site). We took for this analysis, only those individuals banded, photographed and whose image allows to see the band clearly to corroborate their age category: (chick: individuals less than one year old; juvenile: older than two years and younger than four; and adult: greater than 4) at the time of sighting, according to (Galvez et al, in process)

Table No.2. List of chickens and young ringed in Yucatan recaptured between 2012 - 2020 in Cuba

RING	PHOTOGRAPHY	AGE CATEGORY	AUTHOR	PLACE
HTTZ	2012	POLLO	E. Reyes Muriño	C. de Zapata
HTTV	20 12	POLLO	E. Reyes Muriño	C. de Zapata
DLZP	2015	POLLO	J. A. Rivera	La Coloma, Pinar del Río
DNPJ	2015	POLLO	J. A. Rivera	La Coloma, Pinar del Río
DLFN	2015	POLLO	J. A. Rivera	La Coloma, Pinar del Río
DPTS	2016	POLLO	E. Reyes Muriño	C. de Zapata
DLVN	2016	POLLO	E. Reyes Muriño	C. de Zapata
DPBZ	2016	POLLO	E. Reyes Muriño	C. de Zapata
DZNK	2016	POLLO	E. Reyes Muriño	C. de Zapata
DNNB	2016	POLLO	E. Reyes Muriño	C. de Zapata
DNTH	2017	POLLO	Michael. J. Good	C. de Zapata
DLFJ	2018	JOVEN	E. Reyes Muriño	C. de Zapata
DTHP	2019	POLLO	E. Reyes Muriño	C. de Zapata
DTNL	2019	POLLO	Aliesky del Río Leal	C. de Zapata
DTHB	2019	POLLO	Aliesky del Río Leal	C. de Zapata
DSBD	2019	JOVEN	Aliesky del Río Leal	C. de Zapata
DTHD	2019	JOVEN	Susan Robert	C. de zapata
DCTV	2020	JOVEN	E. Reyes Muriño	C. de zapata
DTJV	2020	POLLO	E. Reyes Muriño	C. de zapata
DSPT	2020	JOVEN	I. Andersson	Cayería norte de C. de A.

Fig. 3 Some images of chickens and a young, of the 16 photographs taken in the Ciénaga de Zapata and listed in table No. 2



DTHP pollo menor de un año. Foto. Ernesto Reyes



DTHL Pollo Foto. Aliesky del Río Leal



DNTH joven Foto. Michael J. Good

These marked flamingos generally do not arrive alone but are part of a flock where chicks are mixed with other immature or juveniles and some adults in smaller numbers, observed on the flocks photographed.

Twenty banded juveniles were photographed from 2012 to 2020. Of these, 15 were less than one year old and 5 (more than one year old - less than 4) in the Ciénaga de Zapata, 3 chicks came from the keys south of Pinar del Rio and one juvenile from the northern keys of Ciego de Avila. Five additional adults were found in these localities for the same period.

An additional number of 11 banded individuals were reported from the localities of Ciénaga de Zapata, Guanaroca, Ciego de Avila and Camagüey. Most of them were not photographed and some, although photographed, were not sharp enough to read their markings, so we did not consider them for this analysis.

This preliminary study together with the information provided by volunteers and the historical references of the species in several countries, allows us to predict that the movement of extraterritorial dispersal of the Caribbean Flamingo in Cuba is not erratic, but only in a few flocks each year and may have a longitudinal trend along the Island and orientate towards the south of its distribution range.

The proportion of bands read and photographed in relation to adults in Cuba for these localities and in the same period, is 20 juveniles and immatures (Table No. 2) vs. 4 adults, as can be seen in (Table No.3).

Table No.3 Adults photographed in feeding areas for the same period 2012-2020

RING	FOTOGRAFHY	AGE CATEGORY	AUTHOR	PLACE
DDFC	2018	ADULTO	John Bloomfield	C. de Zapata
HSFT	2019	ADULTO	E. Reyes Muriño	C. de Zapata
HSNL	2019	ADULTO	E. Reyes Muriño	C. de Zapata (anillo mal puesto)
DDNS	2020	ADULTO	Paul Arneson	C. de zapata

Ciénaga de Zapata and the Northern Archipelago is very frequented by tourists, so the review of photos from the eBird site (Del Hoyo, J., et al., 2020) also helped to corroborate and improve the images in the case of the three records we had. We must highlight wildlife photographers, Ernesto Reyes Muriño, Aliesky del Río Leal, who are part of the team of readers of Ciénaga de Zapata and who were the ones, who contributed the greatest number of photographs for this analysis. Thanks to all those who kindly share their photos on the eBird page.

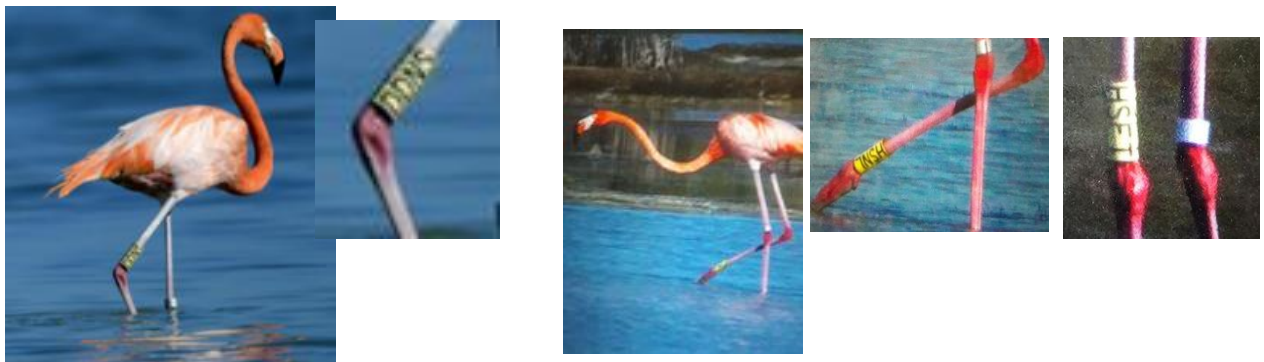
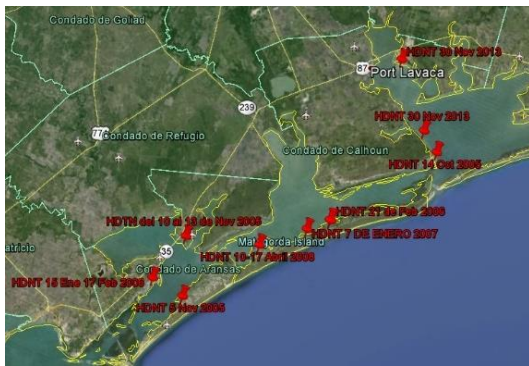


Fig. 4. Adults listed in table No. 3, in feeding areas for the same period 2012-2020.

There are reports and photographs documenting individuals banded in Yucatan visiting other countries besides Cuba (Galvez et al.; 2016; 2017b) and in these cases, they have generally been young individuals. The chick born in 2005 (HDNT) has remained in Texas since that year and remains in the USA. It joined an escaped flamingo from a zoo, with which it has shared adventures since 2007. It keeps moving between different and distant locations (11 reported in these years to the SIAM database) and has not returned. Fig. 5

Fig. 5 Sighting locations of HDN individuals during different years in Texas, USA



. The first record of HDNT was on November 5, 2005, as a chicken of that year.

His first photo occurred in February 2006; about the year he was born.

We have 11 records of this specimen until 2021 and there are many photos of its youth and adult.



By: Cyndi Sellers sept. 2007



BY: Rex Stanford, 24 de October de 2014

This suggests some probable inferences:

- It is the chicks leaving the breeding colony in Ría Lagartos that constitute the majority of sighting reports in Cuba and all of them for the United States and Cayman Brack.
- Because of their gregarious nature, flamingos move in flocks and it is common to see groups of chicks accompanied by some juveniles, sub-adults, and a few adults, leaving the colony to undertake their annual dispersion inside and outside Yucatan, something understandable if one takes into account that the adults remaining in the colony at that time are numerically very few, having previously left the care of the chicks to the so-called "nursemaid" birds.
- The abandonment of the chicks in Yucatan occurs between the end of August and the beginning of November

- which coincides with phenomena such as storms and hurricanes - more and more frequent -, the transitory change of the micro-fauna associated with the high salinity that serves as food can cause another erratic dispersal. This may cause the death of individuals until the levels of fresh water accumulated in the surface water table of the peninsula drop (see details in reports of two contingencies in the Yucatan peninsula). (see details in reports of two environmental contingencies associated with the above, between 2010 and 2020, at <https://www.caribbeancoastconservancy.com/>). In these cases, some flocks or individuals may be carried away by the winds produced by the strong storms that occur in the Caribbean and be diverted to locations where conditions are not more suitable for them to serve as lures and attract other congeners, and this is probably the case of HDNT.

- If there are so many records of a single bird in Texas, it is due to the good birding habit of North Americans and the ease of having cameras and close-up lenses. This is evidence that by increasing readership and field efforts with optical instruments and cameras in Caribbean countries, we may be able to shorten the time to answer for many questions we do not yet know.

In October 2002, a tagged flamingo had been sighted in the United States, the juvenile (DFJV), banded at Peten-Hú in Yucatan Mexico on August 12, 2000, and sighted at Flamingo Point, Everglades National Park on October 20, 2002, and on December 27 of that same year, its mark was read at Gator Lake in the Everglades while with at least 6 other flamingos (Fig. 6). The specimen returned to Yucatán to be read at Celestún, 2003, 2006 and 2007 (Gálvez et al 2017). The record of this dispersal and return to its site of origin seemed to be fortuitous and scarce, however, with the result of radio transmitters placed in Yucatan by the Pedro and Elena Hernandez Foundation and CONANP to 2 adult specimens that arrived in Cuba and returned, this behavior was corroborated once again.

In September 2012, another individual (HRTJ) was seen over a 5-week period with a group of 3 other flamingos at Flamingo Point in Parque Nacional Everglades. This individual was banded at Charca Salinera La Esperanza in Ría Lagartos, Yucatán on 4 September 2010 (Gálvez et al., 2016) and to our knowledge, HRTJ has not been resighted.

In the review of reports received that may have photos in (del Hoyo, J., P. F. D. Boesman, and E. F. J. Garcia 2020), we found a band that had not been reported directly to us, either by other observers or by the author of the photo himself, It is the bird marked with the code (DPDA), an adult photographed on October 23, 2019 by Bryan White in Calusa Keys, Monroe, Florida. It is indescribably useful, that today we researchers can count on a powerful tool such as the one provided by The Cornell Lab of Ornithology at eBird (aVerAves in Spanish).

Twelve chicks arrived on October 7, 2014, at Cayman Brack, (including one individual ringed on September 1, 2014)



Fig.6 Octubre de 2022, el joven (DFJV) en la Florida



Fig.7 (DDVV) junto a un bando de 12 flamencos llega a Caimán B.



Fig.8(DPDA) Bryan White 23de Octubre 2019. Calusan Keys

Citizen science photographic reports from 1950 to 2015 reveal increased sightings of Flamingos throughout this period in the United States (Whitefield et al., 2018).

Is this due to increased visitation and observation by birders in the field, combined with the ease of the creation of the American Flamingo (*Phoenicopterus ruber*) Cornell Lab of Ornithology, (J. del Hoyo, et al. 2020) site to publish them? Is it a greater than natural dispersal caused by problems at breeding or feeding sites in different populations? Could it be a search for other alternatives as an adaptation to climate change? Or is it a combination of any or all of these? There are many questions that are still unanswerable on scientific grounds (Figs. 8 and 9).



Fig. 8 s Douglas Richard, 9 Mar 2000 at West of Bear Lake, Everglades, Monroe, Florida, United States.

With a closeup of the photograph, you can notice the still gray bills and other characteristics that infer that they are 16 young chicks of less than a year old next to three immature ones between two and three years old



Fig.9 Mark and Holly Salvato 29 June 2012 Lake Ingraham-southeast, Monroe, Florida

In a review of this same period in the aforementioned site, including now all the photos for the case of chicks and immatures, taken in each of the countries and islands of the Caribbean, we corroborate the presence of these ages in all its coasts, although there are no breeding sites other than in the six already mentioned. This dispersion has always been observed, only today there are reports and photographs as inescapable proof that the movement exists.

These transboundary movements also occur in the southern distribution of the species. On the coasts of countries such as Curaçao and Aruba where there are no confirmed breeding sites, we also find flocks with numerous chicks and immatures and in the case of Curaçao there are records of specimens that were banded in Bonaire (Fig. 10). (The distance from Bonaire, which is the breeding center, to Curacao is 53km, while the distance to Aruba is 180km, but the distance from Aruba to the coast of Venezuela is only 30km. On the other hand, the flamingos nesting on Bonaire make routine feeding and freshwater flights to the coast of Falcon State, Venezuela, only 100km away).

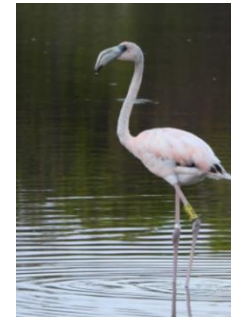
Fig. 10 Immature and adult sighted in Curacao. Banded at Bonaire Island, Caribbean Netherlands



Sandy & Bob Sipe, August 3, 2021, Banded Group in Bonaire. Kaminda Lac Wetlands, Bonaire, Caribbean Netherlands.



B/AKC adulto, Cisca Rush, Sept 2021 en Santa Bárbara Plantation,



B/ANZ immature Cisca Rusch February 9, 2022, Santa Bárbara Plantation, Curacao

Reproductive success decides the survival of any species. The flamingo has long longevity, which has been proven in the wild. In Yucatan in 1977, 99 adult flamingos were banded with plastic bands based on a color combination code (without letters as used after 1999). During this 2022 breeding season at the San Crisanto nesting colony, one specimen was observed incubating (report by Alex Dzid) previously banded as an adult, 48 years earlier. Also, 26 adults older than 20 years, of these 99 specimens, were active, in the colony of Ría Lagartos in the years between 2012 and 2013, when a study was being conducted on the number and distribution of banded in the colony, for this longevity mentioned, have a late sexual maturity, which varies between five and six years, although sub-adults of 4 years, have been observed in the process of nest building and incubating, it has not been possible to corroborate if they have achieved success and proper rearing of their chicks.

They depend for their food on high concentrations of salinity, hence, in all countries with nesting colonies, they are associated with the salt production industry, something that had been previously observed for Yucatan (Romeu E.1997), on the above is the threat of the gradual increase in sea levels and at present, the frequency of hurricanes and local storms that cause torrential rains that cause affectation - especially to the colony and the chicks of the year. In the case of the Bahamas and Yucatan, the salt industries have supported the studies and the conservation programs of the species since its birth; but it does not necessarily happen the same in all the countries and it is an aspect to be worked by the GCFC; another aspect that conspires is that each couple incubates in general terms, one chick and in some years in the different countries, the colony is lost by anthropic factors or natural ones, consequently no births and, the annual replacements of the aged population depend on the survival that the chicks and young. Therefore, the loss of one of these five source colonies, or the loss of a large number of individuals for the region (taking into account that Galapagos flamingos do not migrate; Frías-Soler et al, 2022), could cause an appreciable decline in the coming years and even cause the species to fall into what is known as a "bottleneck", if adverse factors at the breeding sites increase. The use of this species as a tourist attraction, should be done with all protective measures to achieve a low impact on the health of these birds at their feeding sites (Galicia and Baldassare, 1997).

At the GCFC meeting in 2013, the representative of each country brought updated information on the species for the 2000-2012 decade. Some of the compiled data was presented by Gálvez X. and D. Dennis at the workshop on the Caribbean Flamingo, led by both authors, during the 21st International Conference on the Caribbean Flamingo.

Society for the Conservation and Study of Caribbean Birds, held in Cuba in (Gálvez X. and D. Dennis 2017 a and b) where other aspects highlight that:

PRODUCTION OF FLAMINGOS CHICKS IN THE CARIBBEAN		
BAHAMAS (Clum & Ball Preparación)	2000-2012	152 005
BONAIRE (P. Montanus com.pers)	2000- 2011	45 520
CUBA (Fefo, presentación en Mexico, 2013)	1999-2011	189 000
MÉXICO (Migoya - Galvez 2012)	1999-2011	52 700
VENEZUELA	1999-2011	132 220

. - The five primary breeding colonies produced an estimated 571,495 chicks between 2000 and 2011. This Will be the replacement for the old breeders in five to six years assuming they all survive.

-Is the continuous reproduction that is taking place in Los Olivitos Venezuela, in addition to having the ideal feeding conditions and low disturbances, or is it combined with a response of the species to the danger in other sites? Are flamingos moving toward their distribution further south? We don't know yet!

Currently, in addition to Mexico, which is the country that has contributed the most bands for the monitoring of this species, Cuba, Bahamas and recently Bonaire have banded a number of specimens. Once again, we insist that only by increasing the number of countries that band and the number of systematic readers, we can obtain more concrete answers about the pattern of exchange and contribution of each one in this sense. The day we have this information, the alliances between the countries that present the greatest exchange between them can unify efforts and resources to maintain viable populations on their coasts without the worry of one day losing them.

If the efforts of the use of satellite telemetry in Mexico and Florida - where a flamingo has already been radiated - could be extended to other countries in the central and southern distribution of the species, other general evidence could be obtained in less time, such as on the directionality or not of the dispersion. With the georeferencing of the number of localities visited in the country of arrival, we can study the changes that have occurred in the localities of use by using satellite image processing, for example, to analyze habitat changes and, with predictive models, propose management actions for those adverse factors that we still have time to minimize. It is important to implement other studies that can also help identify geographic links for both current and historical populations, among other research, add stable isotope analysis commonly used to trace the geographic origins of animals (Kelly et al., 2002, Wunder et al. 2005) in (S. M. Whitfield et al.,2019).

However, more funds are needed and the alliance between governmental and private institutions to have the will, possibility, and vision to bet on these new technologies that were discussed at the expert meeting since 2013 and that little has been achieved in this regard. The will to face the problems affecting the species as a whole, with new technology, will accelerate the way to find the solution to maintain viable populations, but until that time comes, the birds banded with visible code, and the recapture of these, are a very useful and indispensable tool, which can continue to provide valuable information for some mitigation measures. The metapopulation approach is an important link in the understanding of the distribution and functioning of flamingo populations and protecting and conserving a population without first conceiving it as part of a metapopulation, could lead to erroneous and counterproductive strategies.

Banding individuals with a unique code provides long-term information by contributing to a single database (SIAM) on the exchange of individuals between different countries, fidelity to nesting sites, longevity, recruitment and knowledge about their behavior during their life cycle, as well as their association with certain variables of the habitats they use for their survival, which serve to adopt management measures not only to conserve this species, but can also be an indicator to assess climate change and help other birds that share the same areas.

The effort of banding is not enough if the number of readers is not increased by systematizing the action of searching and reading in all possible countries, both in the Continental and the Insular Caribbean and if this monitoring is done under a methodology that can be compared among all. The researchers that have the coordination in each country should influence the governing bodies of the activity of each one, to share information and see the species as a whole, not focusing on what happens in their territory as a nation. Without these ingredients of great moral value, the work of the GCFC will only have obstacles that will be to the detriment of shorebirds as well as the flamingo

You can directly contribute to this valuable study by reporting the band code you have observed via the website: <https://www.caribbeancoastconservancy.com/>.

Bibliografía

- Amat, J.A., Rendón, M.A., Rendón-Martos, M., Garrido, A. y Ramírez, J.M. 2005. Comportamiento de búsqueda de flamencos mayores durante los periodos de cría y postcría: vinculando las conectividades a los procesos biológicos. *Biol. Conserv.* 125: 183-192
- Anuar Romero (2022) Primer avistamiento gráfico de Fflamenco Americano en el caribe de Honduras- <https://www.hondurastips.hn> ' 2022/07/11
- Arengo Felicity, & Baldassarre, G. A. (1999). Variabilidad de recursos y conservación de los flamencos americanos en humedales costeros de Yucatán, México. *The Journal of Wildlife Management*, 63(4), 1201-1212. DOI: 10.2307/3802838
- Arengo Felicity y Baldassarre G. (2000) Una revisión de la ecología y conservación de los Flamencos del Caribe en Yucatán, México. *Conservation Biology of Flamingos. Waterbirds* 23 (Special Publication 1): 71-79.
- Blanco, P.; B. Sánchez, P. del Pozo y J. Morales (2001) Recapturas del Flamenco Rosado (*Phoenicopterus ruber*) en Cuba durante el período de 1966 al 2000. *El Pitorre*
- Bernardon B, Valsecchi J. (2014) Primer registro del flamenco andino en la Amazonia brasileña. *Rev Bras Ornitol.* 2014;22: 285-287. [Google Scholar
- D Denis, L Mugica, A Rodríguez, M Acosta, O Labrada (2005) -Lista y comentarios acerca de la avifauna de la ciénaga de Birama, Cuba *Biología*, 2005 - [researchgate.net](https://www.researchgate.net)
- Denis, D. (2006). En *Aves acuáticas en los humedales de Cuba* en Mugica et al. (eds.). Científico Técnico. La Habana, Cuba Pp. 8-25.
- del Hoyo, J., P. F. D. Boesman y E. F. J. García (2020). American Flamingo (*Phoenicopterus ruber*), versión 1.0. En *Birds of the World* (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, y E. de Juana, Editores). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.grefla2.01>
- Casler, C.L., Este, E. y Pardo, H. 1994. Reproducción del Flamenco Mayor en el oeste de Venezuela. *Colonial Waterbirds* 17 (1): 28-34.
- Espinoza, F. y L. Torres (2020) Monitoreo de poblaciones de flamencos no reproductores y reproductores en el Refugio de Vida Silvestre y Reserva Pesquera Los Olivitos, Zulia, Venezuela. *Flemingo* 2020, páginas: 12-20.
- Espinoza, F. y L. Torres. 2019. Cría de flamencos del Caribe en el Refugio de Vida Silvestre y Reserva Pesquera Los Olivitos, Zulia, Venezuela. *Flemingo*, 2019, páginas: 27-33.
- Espinoza, F. y Perozo, H. 2008. Cría de flamencos del Caribe en Olivitos Wildlife western Venezuela. *Flemingo*, 16.
- Frías-Soler, R.C., Bauer, A., Grohme, M.A., Espinosa López, G., Gutiérrez Costa, M., Llanes-Quevedo, A., Van Slobbe, F., Frohme, M. y Wink, M. 2022. Phylogeny of the Order Phoenicopteriformes and population genetics of the Caribbean Flamingo (*Phoenicopterus ruber*: Aves), *Zoological Journal of the Linnean Society*
- Fundación Pedro y Elena Hernández - Monitoreo y seguimiento remoto por medio de rastreadores satelitales a 19 Flamencos (*Phoenicopterus ruber*) a tres flamencos que llegan a la isla de Cuba. video en: https://www.facebook.com/watch/?v=1048466599329906&extid=NS-UNK-UNK-UNK-AN_GK0T-GK1C&ref=sharing
- Galicia, E., & Baldassarre, G. (1997). Effects of motorized tourboats on Caribbean Flamingos. *Conservation Biology*, 47, 298-302.

- Gálvez, X., Gavaldón, A., Cruz, N., Guerrero, L., & Marvi, E. (2014). Distribution, abundance, and age composition age composition of Flamingo (*Phoenicopterus ruber*) flocks outside their breeding areas in Yucatán's the wetlands of Yucatan, Mexico. *Cuban Journal of Biological Sciences*, 3(3), 52-59. Retrieved from <http://www.rccb.uh.cu/index.php/RCCB/article/view/277>
- Galvez X., Migoya R., Guerrero I. and D. Denis (2014b) Caribbean Flamingo bandings in Yucatan: current events and perspectives a Vol. 6, No. 1, April 2014.
- Galvez X. -There's a pink stripe on the horizon and it's not the sunset (2015) Cover of the Bulletin of the Cuban Zoological Society Vol. 7, No. 2, August 2015.
- Gálvez, X., Guerrero, L., & Migoya, R. (2016). Physical evidence of metapopulation structure in the Caribbean flamingo (*Phoenicopterus ruber ruber*) from sightings of banded individuals. *Cuban Journal of Biological Sciences*, 4(3), 93-98. Retrieved from <http://www.rccb.uh.cu/index.php/RCCB/article/view/382>
- Galvez X. and D. Denis (2017b) facilitators at the workshop on Flamingo (*Phoenicopterus ruber*) Conservation. Describing an elephant by the trunk: the danger of local abundances in assessing the conservation status of a species. 14 July 2017 in the framework of Birds Caribbean's International Conference. Topes de Collantes, in the Sierra de Escambray- Cuba. from 13-17 July 2017.
- Galvez X. and D. Denis (2017c) " Low concern for the flamingoes? Recent population trends call for urgent attention". Speakers at Birds Caribbean's International Conference. Topes de Collantes, in the Sierra de Escambray- Cuba. from 13-17 July 2017.
- Gálvez X., Migoya R, Guerrero Leonardo (2011). is the pink flamingo as abundant as it seems? *Species. Journal on Conservation and Biodiversity*. 17-23.
- Germain, C., 2002. SIAM System v.2.0 User's Manual. Station Biologique de la Tour du Valat, Le Sambuc, 13200 Arles, France.
- Geraci, J, Béchet, A., Cézilly, F., Ficheus, S., Baccetti, N., Samraoui, B, and Wattier, R., 2012. Greater flamingo colonies around the Mediterranean form a single interbreeding population and share a common history. *Journal of Avian Biology* 43:341-354.
- Johnson, A. and F. Cézilly, F. 2007. The greater flamingo. T and AD Poyser, London.
- Morales Leal, 1996). Río Máximo and the Flamingo (*Phoenicopterus ruber ruber*) (Morales, 1996). *Revista de Flora y Fauna* Vol. 2.
- Morales, José, Loydi Vázquez and Ariam Jiménez (2010)- in BirdLife International (2022) Important Bird Areas factsheet: Río Máximo. Downloaded from <http://www.birdlife.org> on 17/04/2022
- Morales J. leal et al. (2011) speaker at the GCFC international meeting in Freeport, Bahamas (proceedings of the meeting presentations on the Blog).
- Morales Leal et al. (2013) speaker at the GCFC international meeting in Yucatan, Mexico (proceedings of the meeting presentations in Blog)
- Romeu, E. (1997). Flamingos in Yucatan. *CONABIO. Biodiversitas* 15:1-
- Plasencia-Vázquez, Gálvez X., Ferrer Yarelis & Anai Serrano (2017). Temporal variation in the age-specific spatial distribution of *Phoenicopterus ruber* (*Phoenicopteriformes: Phoenicopteridae*) in Yucatan wetlands, *Rev. Biol. Trop. (Int. J. Trop. Biol. ISSN-0034-7744)* Vol. 65 (4): 000-000, December 2017.
- Rodríguez-Casariago, P., D. Rodríguez- Batista, E. Pérez, A. Llanes, P. Blanco, O. Barrio, A. Parada, and F. Cejas. 2003. Distribution and composition of waterbird nesting colonies in the Sabana-Camagüey Archipelago. CD-ROM *Memorias del VII Simposio de Botánica*. ISBN: 959-270-029-X.

Ruiz, E., J. Primelles, P. Rodríguez-Casariago, O. Barrio, D. Rodríguez-Batista, and E. Hernández. 2014. Waterbird communities. Pp. 310-338. In: Terrestrial fauna of the Sabana-Camagüey Archipelago, Cuba (D. Rodríguez-Batista, A. Arias, and E. Ruiz, Eds.). Editorial Academia, La Habana. 444 pp

Ruiz R. Maylén et.,2020. Ramírez Ruiz, M., Barrio Valdés, O., Valier Labañino, M., & Cabrera Romero, E. (2020). Return of a breeding colony of Caribbean Flamingo (*Phoenicopterus ruber*) to the Boca Grande wetland, Nuevitas,

S. M. Whitfield et.al (2018) P. Frezza, F. N. Ridgley, et al (2018) American Flamingos in Florida. The Condor: Ornithological Applications 120:000-000, Q 2018 American Ornithological Society.